

Serial No. ~~09/851,313~~ 9
Docket No. NEC01P069-MSb

REMARKS

Entry of this Amendment is proper because it narrows the issues on appeal and does not require further searching by the Examiner.

Claims 1, 4-5, 8 and 31-32 and 34-52 are all the claims presently pending in the present Application. Claims 1, 5, 41-42 and 49 have been amended to more particularly define the claimed invention. Claims 2, 6 and 33 have been canceled.

It is noted that the amendments are made only to overcome the Examiner's non-statutory objections, and to more particularly define the invention and not for distinguishing the invention over the prior art, for narrowing the scope of the claims, or for any reason related to a statutory requirement for patentability.

It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Claims 1, 4-5, 8, 31, 34-35, 37-38, 41-45, 47-49 and 52 stand rejected under 35 U.S.C. §102 (e) as being anticipated by Yau et al. (US Patent No. 6,054,379).

Claims 2, 6, 32, 36 and 50-51 stand rejected under 35 U.S.C. §103 (a) as being unpatentable over Yau et al. (US Patent No. 6,054,379) as applied to claims 1, 4-5, 8, 31, 34-35, 37-38, 41-45, 47-49 and 52 above, and further in view of The Applicants alleged Admitted Prior Art.

Claim 33 stands rejected under 35 U.S.C. §103 (a) as being unpatentable over Yau et al. (US Patent No. 6,054,379) in view of the prior art as applied to claims 1-2, 4-6, 8, 31-32, 34-38, 41-45 and 47-52 above, and further in view of Aoi (US Patent No. 6,333,257 B1).

Claims 39-40 and 46 stand rejected under 35 U.S.C. §103 (a) as being unpatentable over Yau et al. (US Patent No. 6,054,379) as applied to claims 1 and above, and further in view of Allada et al. (6,218,317 B1) alone or in combination with Chen et al. (Effects of slurry formulations on chemical-mechanical polishing of low dielectric constant polysiloxanes: hydrido-organo siloxane and methyl silsesquioxane).

These rejections are respectfully traversed in view of the following discussion.

BEST AVAILABLE COPY

Serial No. 09/851,313
Docket No. NEC01P069-MSb

10

I. THE CLAIMED INVENTION

The claimed invention (e.g., as recited, for example, in claim 1 and similarly recited in claims 5, 41-42 and 49) is directed to a semiconductor device having a multi-layered insulation film formed on a semiconductor substrate. The multi-layered insulation film includes a first insulation layer including an organosiloxane film having a dielectric constant which is lower than a silicon oxide dielectric constant, a second insulation layer including a polysiloxane compound having an Si-H group and formed on and adhering to a top of the organosiloxane film of the first insulation layer, and a third insulation layer including an inorganic material and formed on and adhering to a top of the second insulation layer. The second insulation layer includes a hydride organosiloxane, and improves an adhesion property between the first insulation layer and the third insulation layer. The device further includes a plurality of wires which are formed in grooves formed in the multi-layered insulation film, the multi-layered insulation film filling a space between the wires (Application at Figure 1; page 23, lines 10-15).

Unlike conventional devices, the claimed invention includes a plurality of wires which are formed in grooves formed in a multi-layered insulation film including a second layer which includes a polysiloxane compound having an Si-H group and formed on and adhering to a top of the organosiloxane film of the first insulation layer. This helps to inhibit a peeling-off of the third insulation layer from the first insulation layer (Application at page 23, lines 10-15).

II. THE ALLEGED PRIOR ART REJECTIONS

A. Yau

The Examiner alleges that Yau teaches the invention of claims 1, 4-5, 8, 31, 34-35, 37-38, 41-45, 47-49 and 52. Applicant submits, however, that Yau does not teach or suggest each and every element of the claimed invention.

Applicant respectfully submits that Yau does not teach or suggest "*a second insulation layer comprising a polysiloxane compound having an Si-H group and formed on and adhering to a top of said organosiloxane film of said first insulation layer*", as recited, for example, in

Serial No. 09/851,313
Docket No. NEC01P069-MSb

11

claim 1 and similarly recited in claims 5, 41-42 and 49.

Unlike conventional devices, the claimed invention includes a plurality of wires which are formed in grooves formed in a multi-layered insulation film including a second layer which includes a polysiloxane compound having an Si-H group and formed on and adhering to a top of the organosiloxane film of the first insulation layer. This helps to inhibit a peeling-off of the third insulation layer from the first insulation layer (Application at page 23, lines 10-15).

Clearly, Yau does not teach or suggest these novel features.

Indeed, the Examiner alleges that Yau (U. S. Patent 6,072,227) teaches most of the features of the invention, and specifically alleges that Yau teaches a second insulation layer including a polysiloxane compound of the claimed invention. However, the Examiner is clearly incorrect.

Indeed, we would point out that Yau merely teaches that that "oxidized organo silane films also provide excellent adhesion between different dielectric layers" (Yau at Abstract). However, this is **directly contrary to the discussion in the Background section of the present invention that states that MSQ does not adhere well to inorganic layers** (Application at page 2, lines 12-27).

Indeed, Applicant would point out that in the claimed invention the second insulation layer includes a polysiloxane compound having an Si-H group and formed on and adhering to a top of the organosiloxane film of the first insulation layer. Clearly, this feature is not taught or suggested by Yau which teaches that oxidized organo silane films adhere well to other dielectric layers.

That is, Yau teaches that **the organosiloxane film of the first insulation layer would adhere well to the inorganic material in the third insulation layer. Thus, Yau would have no reason to form a second insulation layer to improve adhesion between the organosiloxane film and the third insulation layer.**

That is, Yau does not teach or suggest that there is any difference in adhesive properties between different organosiloxanes. The Application, however, teaches that **MSQ does not adhere well to an inorganic material (e.g., silicon dioxide) but a polysiloxane compound having an Si-H group does adhere well to another insulation layer including an inorganic**

Serial No. 09/851,313
Docket No. NEC01P069-MSb

12

material. This is an important feature of the claimed invention and nowhere is it taught or suggested by Yau or any of the other cited references.

Therefore, Yau certainly does not teach or suggest a second insulation layer including a polysiloxane compound having an Si-H group and formed on and adhering to a top of the organosiloxane film of the first insulation layer, as in the claimed invention.

Therefore, we would respectfully submit that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

B. The Alleged Admitted Prior Art (AAPA)

The Examiner alleges that Yau would have been combined with the Alleged Admitted Prior Art (AAPA) to form the invention of claims 2, 6, 32, 36 and 50-51. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Indeed, Applicant submits that these references are completely unrelated, and no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

Further, Applicant submits that there is no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, these references clearly do not teach or suggest their combination. Therefore, Applicant respectfully submits that one of ordinary skill in the art would not have been so motivated to combine the references as alleged by the Examiner. Therefore, the Examiner has failed to make a prima facie case of obviousness.

Further, neither Yau, nor the AAPA, nor any alleged combination thereof teaches or suggests *"a second insulation layer comprising a polysiloxane compound having an Si-H group and formed on and adhering to a top of said organosiloxane film of said first insulation layer"*, as recited, for example, in claim 1 and similarly recited in claims 5, 41-42 and 49. As noted above, this helps to inhibit a peeling-off of the third insulation layer from the first insulation layer (Application at page 23, lines 10-15).

Clearly, this feature is not taught or suggested by the AAPA. Specifically, the Examiner

Serial No. 09/851,313
Docket No. NEC01P069-MSb

13

attempts to rely on Figures 8a-9b; page 2, lines 5-8 and 12-15 and page 5, lines 9-24 of the Application (e.g., the AAPA) to support his position. However, the AAPA merely teaches a layer including layer 2 including an organic material and layer 4 including an inorganic material. Nowhere does the AAPA teach or suggest a layer formed between layer 2 and layer 4 in order to improve an adhesion between layer 2 and layer 4. Instead, the AAPA teaches that in such conventional devices the layer 4 often peels away from layer 2 because of an insufficient adhesion (Application at page 2, lines 12-27).

Thus, certainly the AAPA does not teach or suggest a multi-layered insulation film having a second layer which includes a polysiloxane compound having an Si-H group and formed on and **adhering to a top of the organosiloxane film** of the first insulation layer. Therefore, the AAPA clearly does not make up for the deficiencies of Yau.

Therefore, Applicant respectfully submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

C. Aoi

The Examiner alleges that Yau would have been combined with the Alleged Admitted Prior Art (AAPA), and further with Aoi to form the invention of claim 33. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Indeed, Applicant submits that these references are completely unrelated, and no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

Further, Applicant submits that there is no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, these references clearly do not teach or suggest their combination. Therefore, Applicant respectfully submits that one of ordinary skill in the art would not have been so motivated to combine the references as alleged by the Examiner. Therefore, the Examiner has failed to make a prima facie case of obviousness.

Serial No. 09/851,313
Docket No. NEC01P069-MSb

14

Further, neither Yau, nor the AAPA, nor Aoi, nor any alleged combination thereof teaches or suggests *"a second insulation layer comprising a polysiloxane compound having an Si-H group and formed on and adhering to a top of said organosiloxane film of said first insulation layer"*, as recited, for example, in claim 1 and similarly recited in claims 5, 41-42 and 49. As noted above, this helps to inhibit a peeling-off of the third insulation layer from the first insulation layer (Application at page 23, lines 10-15).

Clearly, these features are not taught or suggested by Aoi. Indeed, the Examiner attempts to rely on Figures 4a-11 and col. 10, lines 1-11 in Aoi to support his position. However, this passage merely teaches an organic film 204 including a polyimide fluoride film or polyaryl ether film. In fact, nowhere in this passage or anywhere else does Aoi teach or suggest a multi-layered insulation film having a second layer which includes a polysiloxane compound having an Si-H group and formed on and **adhering to a top of the organosiloxane film** of the first insulation layer. Therefore, Aoi clearly does not make up for the deficiencies of Yau and the AAPA.

Therefore, Applicant respectfully submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

D. Allada and Chen

The Examiner alleges that Yau would have been combined with Allada and Chen to form the invention of claims 39, 40 and 46. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

In contrast to Yau, Allada is intended to address the problems involved with forming an undoped silicon glass (USG) hardmask on a polymer-insulated material without taking out a wafer from a spin-truck device, by producing multilayered wires in which both the hardmask and a layered insulation material are capable of being spin-coated.

Moreover, in complete contrast to Yau and Allada, Chen is intended to provide a method for chemically and mechanically controlling the chemical mechanical polishing (CMP)

Serial No. 09/851,313
Docket No. NEC01P069-MSb

15

characteristics of polysiloxanes which have low dielectric constants.

Thus, clearly Yau Allada and Chen have completely different problems and objects to be solved. Thus, since the problems and objects to be solved differ between Yau and Allada, there clearly is no motivation to combine Yau and Allada as alleged by the Examiner. Further since the problems and objects to be solved differ between Allada and Chen, there exists no motivation to combine Allada (e.g., or the alleged Yau/Allada combination) with Chen.

In short, Applicant respectfully submits that these references are completely unrelated, and no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

In fact, Applicant submits that the references provide no motivation or suggestion to urge the combination as alleged by the Examiner. Indeed, these references clearly do not teach or suggest their combination. Therefore, Applicant respectfully submits that one of ordinary skill in the art would not have been so motivated to combine the references as alleged by the Examiner. Therefore, the Examiner has failed to make a prima facie case of obviousness.

Moreover, neither Yau, nor Allada, nor Chen, nor any alleged combination thereof teaches or suggests *"a second insulation layer comprising a polysiloxane compound having an Si-H group and formed on and adhering to a top of said organosiloxane film of said first insulation layer"*, as recited, for example, in claim 1 and similarly recited in claims 5, 41-42 and 49. As noted above, this helps to inhibit a peeling-off of the third insulation layer from the first insulation layer (Application at page 23, lines 10-15).

Clearly, the cited references do not teach or suggest these novel features.

Specifically, Allada does not teach or suggest these novel features of the claimed invention. Indeed, the Examiner merely attempts to rely on Allada as allegedly teaching an insulating film including a methylated hydrido organo siloxane polymer (HOSP).

Specifically, the Examiner attempts to rely on col. 2, lines 7-67 in Allada to support his position. However, nowhere in this passage, or anywhere else for that matter, does Allada teach or suggest a multi-layered insulation film having a second layer which includes a polysiloxane compound having an Si-H group and formed on and adhering to a top of the organosiloxane film of the first insulation layer.

BEST AVAILABLE COPY

Serial No. 09/851,313
Docket No. NEC01P069-MSb

16

Indeed, this passage merely teaches a layer including HOSP that is used as a mask 28 and is formed between two polymer layers 24, 26 (Allada at col. 3, lines 7-25; Figure 2b). That is, nowhere does Allada even teach or suggest a multi-layered insulation film having a second layer which includes a polysiloxane compound having an Si-H group, let alone a multi-layered insulation film in which a second layer including polysiloxane is formed on and **adhering to a top of the organosiloxane film** of the first insulation layer.

Thus, Allada clearly does not make up for the deficiencies of Yau.

Likewise, Chen does not teach or suggest these novel features. Indeed, the Examiner again attempts to rely on Chen as teaching methylated hydrido organo siloxane polymer (HOSP). The Examiner attempts to rely on Figure 1 in Chen to support his position.

However, nowhere in Figure 1, or anywhere else for that matter, does Chen even teach or suggest a multi-layered insulation film having a second layer which includes a polysiloxane compound having an Si-H group, let alone a multi-layered insulation film in which a second layer including polysiloxane is formed on and **adhering to a top of the organosiloxane film** of the first insulation layer.

Thus, Chen clearly does not make up for the deficiencies of the alleged Yau/Allada combination.

Therefore, Applicant respectfully submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

In short, **none of the cited references teach or suggest any reason to form a second insulation layer including a polysiloxane on a first insulation layer including an organosiloxane film.** Therefore, none of these other references or their combination teach or suggest the claimed invention.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1, 4-5, 8 and 31-32 and 34-52, all the claims presently pending in the application, are patentably distinct over the prior art of record

Serial No. 09/851,313
Docket No. NEC01P069-MSb

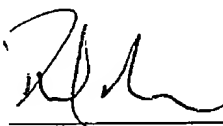
17

and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully submitted,

Date: 11/14/05

Phillip E. Miller, Esq.
Reg. No. 46,060

McGinn IP Law Group, PLLC
8321 Old Courthouse Rd., Suite 200
Vienna, Virginia 22182
(703) 761-4100
Customer No. 21254

CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that the foregoing was filed by facsimile with the United States Patent and Trademark Office, Examiner Julio Maldonado, Group Art Unit #2823 at fax number 571-273-8300 this 14th day of November, 2005.



Phillip E. Miller
Reg. No. 46,060